

claim 36, put into independent form. New claims 46-49 are ultimately dependent on claim 1 and are fully supported by the specification, particularly the embodiments of FIGS. 3 and 9.

Examiner Waks is thanked for the courtesy of the telephone interview with Applicant's attorney on April 30, 2002. During the interview it was clarified that claims 34 and 35 were rejected as anticipated by U.S. Patent No. 5,942,824 (Shioya). No other specific prior art or amendment was discussed. The interview was generally directed to discussing which claims were not rejected over prior art.

The Office Action notes that numerous references have been cited in supplemental information disclosure statements, and takes the position that a large volume of the cited prior art is not material and may obscure a single material reference. As explained previously, Applicant has filed a number of applications that are closely related. To avoid an argument by an infringer that the patent is invalid because prior art from related applications was not brought to the attention of the Examiner in this case, it was Applicant's intention to try to make all references cited in each of the related case of record in the other cases. In view of the Examiner's comments, Applicant has not continued to cite all references in this case.

Applicant however does wish to note three references which Applicant believes to be material: U.S. Patents Nos. 4,128,527 (Kinjo); 5,241,229 (Katakura) and 5,694,268 (Dunfield).

In the outstanding Office Action claims 14-19, 27 and 38-41 were rejected under 35 U.S.C. § 112 first paragraph. The foregoing amendment overcomes the rejection of claims 14-19 and 38-41 with respect to the units for the coefficient of linear thermal expansion, and provides proper antecedent basis for claim 16. The rejections of claims 27 and 41 as not being supported by the specification are respectfully traversed. Claim 27 is fully supported by page 20, lines 9-10. Claim 41 is supported by page 27, lines 15-24.

Claims 1-4, 6, 10, 21-23, 26, 29 and 37 were rejected in the outstanding Office Action under 35 U.S.C. §102(b) as being anticipated by Yamano. This rejection is respectfully traversed. Claim 1 is directed to a motor and requires a stator comprising conductors, a shaft, a bearing, a hub and a monolithically formed body that substantially encapsulates the stator, wherein a thermoplastic material is injection molded to form the

body. In addition, the limitations of claim 7 have been added to claim 1. Claim 1 now further requires that mounting features are formed in the body to mount the motor to a device to be powered by the motor.

Since claim 7 was not rejected over Yamano, it is believed that the patentability of amended claim 1 over Yamano has been recognized by the Examiner. Yamano does not disclose or suggest that mounting features (such as apertures 25 of FIG. 3) be formed in a body of thermoplastic material.

Claim 1, and claims 2-4, 6, 10, 21-23, 26, 29 and 37 dependent thereon, are therefore not anticipated by Yamano.

Claim 49 specifically calls for apertures. No apertures are found in the flange 1a of Yamano. Further, it is believed that the synthetic resin used in Yamano, while having high thermal conductivity, would not be a material that had sufficient strength so that one of ordinary skill in the art would consider using it to provide mounting features.

The Office Action takes the position that the requirement that the material be injection molded is a method of forming the device and is not germane to patentability of the device itself. This position is respectfully traversed. Also the functional limitations in dependent claims are to be given patentable weight. These limitations further describe the nature of the invention. Even though injection molding is a process, it produces a distinct nature to a part. Further, *In re Fuller*, 1929 C.D. 1972, 17 C.C.P.A. 571, 35 F.2d 62 (C.C.P.A. 1929) does not stand for the broad assertion that functional limitations in product claims are only to be given patentable weight if they are recited as a "means plus function" recitation. 35 U.S.C. § 112 ¶ 6 was enacted after *In re Fuller* was decided. The claim at issue in *Fuller* was held to be too broad, reading on the prior art or not being supported by the specification. Also, one of the claims at issue was "A woolen cloth having a tendency to wear rough rather than smooth." Such a claim, describing only a result, is quite different than the present claims which describe many structural elements, and then further define the nature of some of those elements by stating that parts are fixed to one another, or the motor is capable of certain speeds.

In the outstanding Office Action, claims 1-4, 6, 22, 23 and 26 were rejected under 35 U.S.C. § 102(b) as being anticipated by Japanese Patent Publication No. 405336722A (Osawa). This rejection is respectfully traversed. Claim 1 requires that the body, which substantially encapsulates the stator conductors, is configured to align

the shaft, hub and bearing with respect to the stator. In Osawa, the plastic resin 15 may encapsulate the stator core and its windings, but the body of plastic resin is not configured to provide any alignment function. As pointed out on page 12, lines 23-25, the body 14 of Fig. 3 provides a single structure that aligns the stator with the other motor components (bearing, shaft, disc support member). In the embodiment of Fig. 3 this is accomplished because the bearings are fixed to the body 14. In Osawa, the plastic resin 15 is not configured to provide any alignment. Rather, as seen in Figs. 1, 7, and 8, the part labeled No. 7 holds the bearings in place, and the encapsulated stator appears to simply fit into the shape made in part No. 7.

Claim 1, and claims 2-4, 6, 22, 23 and 26 dependent thereon, are thus not anticipated by Osawa.

Claims 1, 3, 5-8, 11-13, 21, 28, 30-35, 43 and 44 were rejected in the outstanding Office Action under 35 U.S.C. §102(e) as being anticipated by Shioya. This rejection is also respectfully traversed. Shioya discloses a motor and method of manufacturing the same. The Office Action takes the position that the embodiment of Fig. 7 of Shioya discloses a monolithically formed body 126, 124 substantially encapsulating the stator 60 and substantially encapsulating an insert 72. While Shioya does suggest that the base portion 122, pedestal portion 124 and holder portion 126 are integrally formed, there is no suggestion that the drive coils 70 are encapsulated in that piece. The drawings do not show any plastic material substantially surrounding the drive coils. Claim 1 has been amended to clarify that the conductors of the stator are substantially encapsulated.

Thus Shioya does not disclose injection molding a body that substantially encapsulates stator conductors as required by claim 1. Claims 3, 5-8, 11-13, 21, 28, 30-35, 43 and 44 are dependent on claim 1 and are therefore also not anticipated by Shioya.

Claims 9 and 10 were rejected in the outstanding Office Action under 35 U.S.C. §103(a) as being unpatentable over Shioya in view of U.S. Patent No. 6,043,583 (Kurosawa). This rejection is respectfully traversed. As noted above, Shioya does not disclose stator conductors substantially encapsulated in an injection molded body. Kurosawa does not disclose injection molding a body to substantially encapsulate stator

conductors. Therefore the combination of Shioya and Kurosawa does not disclose the elements of claim 1, nor of claims 9 and 10 dependent thereon.

Claims 24 and 25 were rejected under 35 U.S.C. § 103(a) in the outstanding Office Action as unpatentable over Osawa in view of U.S. Patent No. 6,075,304 (Nakatsuka). This rejection is respectfully traversed. Claims 24 and 25 are dependent on claim 1 and are patentable over Osawa for the reasons recited above. Nakatsuka does not disclose or suggest the concept of using a body of phase change material substantially encapsulating stator conductors to also align the stator with a shaft, hub and bearings. Thus the combination of Osawa and Nakatsuka would not make the invention of claim 1 obvious. Claims 24 and 25 are therefore patentable over Osawa and Nakatsuka.

Claim 38 was rejected under 35 U.S.C. § 1.75 as being substantially identical to claim 14. It is submitted that both claims 38 and 14 do not have the same scope. For example, claim 38 requires that the body be configured to align the stator with the shaft, bearing and hub. That element is not required in claim 14. The amendment to claim 1 herein makes the scope of claims 14 and 38 even more different. This rejection should therefore be withdrawn.

Various of the claims were rejected under the judicially created doctrine of obviousness-type double patenting over claims of U.S. Patent No. 6,300,695. Without acquiescing to the correctness of such rejections, Applicant submits herewith a terminal disclaimer which is effective to overcome these rejections.

The allowability of claim 36 is noted with appreciation. Former claim 36 in independent form is presented as new claim 45, and is believed to be allowable. Claims 14-19, 20, 27 and 41 were not rejected over prior art. Therefore, with the terminal disclaimer and amendments these claims are believed to also be in a condition for allowance.

Since each of the rejections have been overcome, the case is in condition for allowance. An early notice to that effect is respectfully requested.

Respectfully submitted,

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APPENDIX A

1. Changes to the paragraph on page 27, line 27, to page 28, line 9, are as follows:

(Twice amended) One preferred thermoplastic material, Konduit OTF-212-11, was made into a thermoplastic body and tested for its coefficient of linear thermal expansion by a standard ASTM test method. It was found to have a CLTE in the range of -30 to 30°C of 1.09×10^{-5} in/in $^{\circ}\text{F}$ in the X direction and 1.26×10^{-5} in/in $^{\circ}\text{F}$ in both the Y and Z directions, and a CLTE in the range of 100 to 240°C of 1.28×10^{-5} in/in $^{\circ}\text{F}$ in the X direction and 3.16×10^{-5} in/in $^{\circ}\text{F}$ in both the Y and Z directions. (Hence, the relevant CLTEs for purposes of defining the invention are 1.09×10^{-5} in/in $^{\circ}\text{F}$ and 1.28×10^{-5} in/in $^{\circ}\text{F}$.) Another similar material, Konduit PDX -0-988, was found to have a CLTE in the range of -30 to 30°C of 1.1×10^{-5} in/in $^{\circ}\text{F}$ in the X direction and 1.46×10^{-5} in/in $^{\circ}\text{F}$ in both the Y and Z directions, and a CLTE in the range of 100 to 240°C of 1.16×10^{-5} in/in $^{\circ}\text{F}$ in the X direction and 3.4×10^{-5} in/in $^{\circ}\text{F}$ in both the Y and Z directions. By contrast, a [PBS] PPS type polymer, (Fortron 4665) was likewise tested. While it had a low CLTE in the range of -30 to 30°C (1.05×10^{-5} in/in $^{\circ}\text{F}$ in the X direction and 1.33×10^{-5} in/in $^{\circ}\text{F}$ in both the Y and Z directions), it had a much higher CLTE in the range of 100 to 240°C (1.94×10^{-5} in/in $^{\circ}\text{F}$ in the X direction and 4.17×10^{-5} in/in $^{\circ}\text{F}$ in both the Y and Z directions).

2. Changes to the claims are as follows:

1. (Twice amended) A [high speed spindle] motor [for a disc drive] comprising:

- a) a shaft having a rotational axis;
- b) a [disc support member] hub attached to the shaft and including a permanent magnet;
- c) a bearing allowing rotation of the [disc support member] hub about the rotational axis of the shaft;
- d) a stator comprising conductors; and
- e) a monolithically formed body that substantially encapsulates the stator conductors, wherein a thermoplastic material is injection molded to form the body

and the body is configured to align the shaft, [disc support member] hub and bearing with respect to [one another] the stator; and mounting features are formed in the body to mount the motor to a device to be powered by the motor.

2. (Amended) The [high speed] motor of claim 1 wherein the body surrounds the bearing.

3. (Amended) The [high speed] motor of claim 1 wherein the bearing comprises an upper bearing and a lower bearing.

4. (Amended) The [high speed] motor of claim 3 wherein the body substantially surrounds the upper bearing and the lower bearing.

5. (Amended) The [high speed] motor of claim 1 wherein the shaft is fixed relative to the body.

6. (Amended) The [high speed] motor of claim 1 wherein the shaft is freely rotatable relative to the body.

7. (Amended) The [high speed] motor of claim 1 wherein the mounting features [are formed in the body to mount the high speed motor to] are configured to allow the motor to be mounted to a hard disc drive.

8. (Amended) The [high speed] motor of claim 1 wherein an insert is substantially encapsulated within the body.

9. (Amended) The [high speed] motor of claim 1 wherein the permanent magnet is concentrically disposed around the stator.

10. (Amended) The [high speed] motor of claim 1 wherein the stator concentrically surrounds the permanent magnet.

11. (Amended) The [high speed] motor of claim 1 wherein a second magnet is substantially encapsulated within the body.

12. (Twice amended) The [high speed] motor of claim 11 wherein the second magnet is an enhancement magnet.

13. (Twice amended) The [high speed] motor of claim 11 wherein the second magnet is part of a magnetic bearing.

14. (Twice amended) A high speed spindle motor for a disc drive comprising:

- a) a shaft;
- b) a disc support member attached to the shaft;
- c) a bearing disposed around the shaft;
- d) a stator; and
- e) a monolithically formed body that substantially encapsulates the stator, the monolithically formed body surrounding the bearings and the shaft, the body being formed by injection molding and being made of a material having a coefficient of linear thermal expansion of less than 2×10^{-5} [in/in/°F] in/in °F throughout the range of 0-250°F.

16. (Amended) The high speed motor of claim [14]15 wherein the body concentrically surrounds the upper bearing and the lower bearing.

20. (Amended) A high speed spindle motor for a disc drive comprising:

- a) a shaft;
- b) a disc support member attached to the shaft and including a permanent magnet;
- c) a bearing surrounding the shaft;
- d) a stator; and
- e) a monolithically formed body that substantially encapsulates the stator, wherein a thermoplastic material is injection molded to form the body, the material has a coefficient of thermal conductivity of at least 0.7 watts/meter°K at 23°C and the body is configured to align the shaft, disc support member and bearing with respect to [one another] the stator.

21. (Amended) The [high speed] motor of claim 1 wherein the bearing is fixed to the body.

22. (Amended) The [high speed] motor of claim 1 wherein the hub comprises a disc support member and the shaft is fixed to the disc support member.

23. (Amended) The [high speed] motor of claim 1 wherein the stator further comprises a core and the conductors [that] induce magnetic fields in the core when current is conducted by the conductors.

24. (Amended) The [high speed] motor of claim 23 wherein the core comprises steel laminations.

25. (Amended) The [high speed] motor of claim 23 wherein the core has a plurality of poles and the conductors comprise windings around said poles.

26. (Amended) The [high speed] motor of claim 1 wherein the bearing comprises ball bearings.

27. (Amended) The [high speed] motor of claim 26 wherein the motor comprises a high speed spindle motor and the bearings comprise oversized bearings having an outer diameter of over 13 mm.

28. (Amended) The [high speed] motor of claim 1 wherein the bearing is a hydrodynamic bearing.

29. (Amended) The [high speed] motor of claim 1 wherein the motor is able to operate at at least 10,000 rpm.

30. (Amended) The [high speed] motor of claim 8 wherein the insert provides structural rigidity to the body.

31. (Amended) The [high speed] motor of claim 8 wherein the insert enhances heat transfer away from the bearing and the stator.

32. (Amended) The [high speed] motor of claim 1 wherein a first portion of a magnetic bearing is substantially encapsulated within the body and a second opposing portion of the magnetic bearing is attached to the [disc support member] hub.

33. (Amended) The [high speed] motor of claim 32 wherein the body has been machined to provide precise tolerance between the first and second portions of the magnetic bearing.

34. (Amended) The [high speed] motor of claim 8 wherein the insert enhances dampening of motor vibration.

35. (Amended) The [high speed] motor of claim 8 wherein the insert enhances dampening of audible noise.

36. (Amended) The [high speed] motor of claim 8 wherein the shaft is fixed to the body and the insert is positioned between the shaft and the bearing.

37. (Amended) The [high speed] motor of claim 1 wherein the thermoplastic material includes ceramic particles.

38. (Amended) The [high speed] motor of claim 1 wherein the thermoplastic material has a coefficient of linear thermal expansion of less than 2×10^{-5} [in/in/°F] in/in °F throughout the range of 0-250°F.

39. (Amended) The [high speed] motor of claim 1 wherein the thermoplastic material has a coefficient of linear thermal expansion of less than 1.5×10^{-5} [in/in/°F] in/in °F throughout the range of 0-250°F.

40. (Amended) The [high speed] motor of claim 1 wherein the thermoplastic material has a coefficient of linear thermal expansion of between about 0.8×10^{-5} [in/in/°F] in/in °F and about 1.2×10^{-5} [in/in/°F] in/in °F throughout the range of 0-250°F.

41. (Amended) The [high speed] motor of claim 1 wherein the bearing comprises steel, the [disc support member] hub comprising aluminum and the thermoplastic material has a coefficient of linear thermal expansion that is between the coefficient of linear thermal expansion of the steel and the coefficient of linear thermal expansion of the aluminum.

42. (Amended) The [high speed] motor of claim 1 wherein the thermoplastic material comprises polyphenyl sulfide.

43. (Amended) The [high speed] motor of claim 1 wherein the shaft is fixed to the thermoplastic body by being molded with the stator in the thermoplastic body.

44. (Amended) The [high speed] motor of claim 1 wherein the bearing is fixed to the thermoplastic body with a press fit.

45. (New) A high speed spindle motor for a disc drive comprising:

- a) a shaft having a rotational axis;
- b) a disc support member attached to the shaft and including a permanent magnet;
- c) a bearing allowing rotation of the disc support member about the rotational axis of the shaft;
- d) a stator; and
- e) a monolithically formed body that substantially encapsulates the stator, wherein a thermoplastic material is injection molded to form the body and the body is configured to align the shaft, disc support member and bearing with respect to the stator; and wherein the shaft is fixed to the body and an insert is substantially encapsulated within the body and is positioned between the shaft and the bearing.

46. (New) The motor of claim 8 wherein the insert is rigidly fixed to the stator by the body and is connected to the stator only through the thermoplastic material.

47. (New) The motor of claim 46 wherein the shaft is fixed to the insert by being substantially encapsulated by the thermoplastic material.

48. (New) The motor of claim 46 wherein the bearing is fixed to the insert by being substantially encapsulated by the thermoplastic material.

49. (New) The motor of claim 1 herein said mounting features comprise apertures.